

MINNESOTA ALIGNMENT FOR NIH SUPPLEMENT DOING SCIENCE: THE PROCESS OF SCIENTIFIC INQUIRY

<b>DOING SCIENCE: THE PROCESS OF SCIENTIFIC INQUIRY</b>		
<b>Minnesota Academic Standards and Benchmarks: Science – Grades 6 – 8</b>		
<b>Grade 6</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>All lessons</b>	<b>I.A.1</b>	Distinguish between scientific evidence and personal opinion.
<b>1, 2</b>	<b>I.A.2</b>	Explain why scientists often repeat investigations to be sure of the results.
<b>All lessons</b>	<b>I.B.1</b>	Identify questions that can be answered through scientific investigation and those that cannot.
<b>All lessons</b>	<b>I.B.2</b>	Distinguish among observation, prediction and inference.
<b>1</b>	<b>I.B.3</b>	Use appropriate tools and Système International (SI) units for measuring length, time, mass, volume and temperature with suitable precision and accuracy.
<b>1, 3, 4</b>	<b>I.B.4</b>	Present and explain data and findings from controlled experiments using multiple representations including tables, graphs, physical models and demonstrations.
<b>All lessons</b>	<b>I.C.2</b>	Explain why scientists may work in teams or work alone, can collaborate and, at times, compete.
<b>Grade 7</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>1, 3, 4</b>	<b>I.A.1</b>	Recognize how scientific knowledge is subject to change as new evidence becomes available, or as new theories cause scientists to look at old observations differently.
<b>1, 3, 4</b>	<b>I.A.2</b>	Explain natural phenomena by using appropriate physical, conceptual and mathematical models.
<b>All lessons</b>	<b>I.B.1</b>	Formulate a testable hypothesis based on prior knowledge.
<b>All lessons</b>	<b>I.B.2</b>	Recognize that a variable is a condition that may influence the outcome of an investigation and know the importance of manipulating one variable at a time.
<b>1, 2, 3</b>	<b>I.B.3</b>	Write a specific step-by-step procedure for a scientific investigation.
<b>1, 3, 4</b>	<b>I.B.4</b>	Explain how classroom scientific investigations relate to established scientific principles.
<b>3, 4</b>	<b>IV.G.1</b>	Recognize that disease can be caused by genetics, infection by other organisms, exposure to environmental factors or a combination of these.
<b>3, 4</b>	<b>IV.G.2</b>	Identify risks associated with natural, chemical and biological hazards.
<b>Grade 8</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>3, 4</b>	<b>I.A.1</b>	Explain and give examples of how science can be used to make informed ethical decisions by identifying likely consequences of particular actions

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1, 2, 3	I.A.2	Explain the development, usefulness and limitations of scientific models in the explanation and prediction of natural phenomena.
All lessons	I.B.1	Know that scientific investigations involve the common elements of systematic observations, the careful collection of relevant evidence, logical reasoning and innovation in developing hypotheses and explanations.
All lessons	I.B.2	Describe how scientists can conduct investigations in a simple system and make generalizations to more complex systems.
All lessons	I.B.1	Specify variables to be changed, controlled and measured.
1, 3, 4	I.B.2	Use sufficient trials and adequate sample size to ensure reliable data.
1, 3	I.B.3	Use appropriate technology and mathematics skills to access, gather, store, retrieve and organize data.
3, 4	I.C.1	Evaluate the credibility and validity of scientific and technological information from various sources.

**Minnesota Academic Standards and Benchmarks: Mathematics – Grades 6 – 8 (11/2006 Draft Version)**

**Grade 6**

Lesson	Standard	Benchmark
3, 4	<b>Number Sense A.2</b>	Understand the inverse relationship between addition and subtraction, and fluently perform addition and subtraction with positive rational numbers in both decimal and fractional form.
3, 4	<b>Number Sense A.4</b>	Understand the inverse relationship between multiplication and division, and fluently perform multiplication and division with positive rational numbers in decimal, fractional, and percent form.
3, 4	<b>Number Sense A.6</b>	Represent positive rational numbers as fractions, mixed numbers, decimals, or percents; and convert among various forms as appropriate in real world and mathematical problems.
3, 4	<b>Algebra B.2</b>	Solve one-step equations involving positive whole numbers or decimals.
3, 4	<b>Data &amp; Probability A.2</b>	Use charts and graphs, including line graphs that display changes over time, to represent data.
3, 4	<b>Information &amp; Technology Literacy A.1</b>	Use a computer with appropriate software or Internet applications to analyze and display data; explore two-dimensional shapes under transformations. Use a calculator to explore patterns with exponents as repeated multiplication or division.
3, 4	<b>Information &amp; Technology Literacy B.1</b>	Generate research questions based on assigned topics or interests, gather data, organize, display and evaluate information, make conclusions, make predictions between data points, present results to an audience, and identify strengths and weaknesses of the process.

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<b>Grade 7</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
3, 4	<b>Number Sense A.1</b>	Represent rational numbers as fractions, mixed numbers, decimals, percents, or scientific notation (positive and negative powers of 10) and convert among various forms as appropriate in real world and mathematical problems.
3, 4	<b>Number Sense A.2</b>	Efficiently and accurately perform addition, subtraction, multiplication, and division using positive and negative rational numbers, in decimal and fractional forms.
3, 4	<b>Algebra A.2</b>	Use ratios and proportions to solve problems in numerous contexts including percent problems (taxes, discounts, tips), problems about similar geometric objects (using scale factors), and problems involving a constant rate of change (distance-speed), and unit conversion where the conversion factor is given.
3, 4	<b>Information &amp; Technology Literacy A.1</b>	Use a computer with appropriate software or Internet applications to analyze and display data; explore similarity. Use a calculator to explore patterns with exponents as repeated multiplication or division and to understand irrational roots and scientific notation.
3, 4	<b>Information &amp; Technology Literacy B.1</b>	Generate research questions based on assigned topics or interests, gather data, organize, display and evaluate information, make conclusions, make predictions between data points, present results to an audience, and identify strengths and weaknesses of the results and process.
<b>Grade 8</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
3, 4	<b>Information &amp; Technology Literacy B.1</b>	Generate research questions based on assigned topics or interests, gather data, organize, display and evaluate information, make conclusions, make predictions between data points, present results to an audience, and identify strengths and weaknesses of the results and process.
<b>Minnesota Academic Standards and Benchmarks: Language Arts – Grades 6 – 8</b>		
<b>Grade 6</b>		
<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>All lessons</b>	<b>I.A.1</b>	Read unfamiliar complex and multi-syllabic words using advanced phonetic analysis and structural analysis.
<b>All lessons</b>	<b>I.B.1</b>	Acquire, understand and use new vocabulary through explicit vocabulary instruction and independent reading.
<b>All lessons</b>	<b>I.C.1</b>	Summarize and paraphrase what is read.
<b>All lessons</b>	<b>I.C.2</b>	Recall and use prior learning and preview text to prepare for reading.

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<b>All lessons</b>	<b>I.C.3</b>	Generate and answer literal, inferential, interpretive and evaluative questions to demonstrate understanding about what is read.
<b>All lessons</b>	<b>I.C.5</b>	Identify the main idea and supporting details.
<b>All lessons</b>	<b>I.C.7</b>	Distinguish fact from opinion and give examples from text.
<b>All lessons</b>	<b>I.C.9</b>	Create outlines, logical notes and summaries across content areas.
<b>All lessons</b>	<b>I.C.12</b>	Compare and contrast information from different sources on the same topic.
<b>All lessons</b>	<b>II.A.1</b>	Write frequently in a variety of forms, including but not limited to the following: poems, stories, plays, essays, journals, letters, directions, editorials, business communications and reports.
<b>All lessons</b>	<b>II.B.1</b>	Create multiple paragraph compositions that state, maintain and use details in a logical order to support a main idea.
<b>All lessons</b>	<b>II.B.3</b>	Create informative reports, including gathering material, formulating ideas based on gathered material, organizing information, and editing for logical progression.
<b>All lessons</b>	<b>II.C.1</b>	Compose complete sentences when writing.
<b>All lessons</b>	<b>II.C.3</b>	Apply grammar conventions correctly in writing.
<b>All lessons</b>	<b>II.C.4</b>	Apply punctuation conventions correctly in writing.
<b>All lessons</b>	<b>II.D.1</b>	Gather and synthesize information from a variety of sources, including electronic and print.
<b>All lessons</b>	<b>III.A.1</b>	Participate in and follow agreed-upon rules for conversation and formal discussions in large and small groups.
<b>All lessons</b>	<b>III.A.2</b>	Know and apply listening rules and expectations for formal settings and demonstrate comprehension.
<b>All lessons</b>	<b>III.A.3</b>	Actively listen and comprehend messages.
<b>All lessons</b>	<b>III.A.5</b>	Distinguish between a speaker's opinion and verifiable facts.
<b>All lessons</b>	<b>III.A.6</b>	Orally communicate information, opinions and ideas effectively to different audiences for a variety of purposes.
<b>3</b>	<b>III.C.2</b>	Evaluate the accuracy and credibility of information found on Internet sites.

**Grade 7**

<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>All lessons</b>	<b>I.A.1</b>	Read unfamiliar complex and multi-syllabic words using cueing systems, advanced phonetic analysis and structural analysis.
<b>All lessons</b>	<b>I.B.1</b>	Acquire, understand and use new vocabulary through explicit vocabulary instruction and independent reading.
<b>All lessons</b>	<b>I.B.2</b>	Analyze word structure and use context clues to understand new words.
<b>All lessons</b>	<b>I.C.1</b>	Comprehend, interpret and evaluate text by asking and answering questions.
<b>All lessons</b>	<b>I.C.2</b>	Recall and use prior learning and preview text to prepare for reading.
<b>All lessons</b>	<b>I.C.4</b>	Make inferences and draw conclusions based on explicit and implied information from texts.
<b>All lessons</b>	<b>I.C.5</b>	Create outlines, logical notes and summaries across content areas.

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<b>All lessons</b>	<b>I.C.7</b>	Distinguish statements of fact from opinion and give examples from text.
<b>All lessons</b>	<b>I.C.9</b>	Follow written directions in technical reading.
<b>All lessons</b>	<b>II.A.1</b>	Write frequently in a variety of forms, including but not limited to the following: poetry, stories, essays, editorials, letters, directions and research reports.
<b>All lessons</b>	<b>II.B.1</b>	Create multiple paragraph compositions that state, maintain and use details in a logical order to support a main idea.
<b>All lessons</b>	<b>II.B.3</b>	Create informative reports, including gathering material, formulating ideas based on gathered material, organizing information, and editing for logical progression.
<b>All lessons</b>	<b>II.B.5</b>	Consider the intended audience when composing text.
<b>All lessons</b>	<b>II.C.1</b>	Compose complete sentences when writing.
<b>All lessons</b>	<b>II.C.3</b>	Apply grammar conventions correctly in writing.
<b>All lessons</b>	<b>II.C.4</b>	Apply punctuation conventions correctly in writing.
<b>All lessons</b>	<b>II.D.1</b>	Formulate questions and collect and assess relevant information to address these questions.
<b>All lessons</b>	<b>II.D.3</b>	Gather and organize information from a variety of sources, including electronic and print.
<b>All lessons</b>	<b>III.A.1</b>	Participate in and follow agreed-upon rules for conversation and formal discussions in large and small groups.
<b>All lessons</b>	<b>III.A.2</b>	Know and apply listening rules for formal settings.
<b>All lessons</b>	<b>III.A.4</b>	Distinguish between speaker's opinion and verifiable facts and analyze the credibility of the presentation.
<b>All lessons</b>	<b>III.A.6</b>	Orally communicate information, opinions, and ideas effectively to different audiences for a variety of purposes.
<b>All lessons</b>	<b>III.A.7</b>	Adjust delivery and language in oral presentations for the intended audiences and purposes.
<b>3</b>	<b>III.C.2</b>	Evaluate the accuracy and credibility of information found on Internet sites.
<b>3</b>	<b>III.C.4</b>	Critically analyze the messages and points of view employed in different media, including advertising, news programs, web sites, and documentaries.

**Grade 8**

<b>Lesson</b>	<b>Standard</b>	<b>Benchmark</b>
<b>All lessons</b>	<b>I.B.1</b>	Acquire, understand and use new vocabulary through explicit and indirect vocabulary instruction and independent reading.
<b>All lessons</b>	<b>I.C.1</b>	Summarize and paraphrase main idea and supporting details.
<b>All lessons</b>	<b>I.C.2</b>	Recall and use prior learning and preview text to prepare for reading.
<b>All lessons</b>	<b>I.C.3</b>	Comprehend, interpret and evaluate information in a variety of texts using a combination of strategies before, during and after reading.
<b>All lessons</b>	<b>I.C.4</b>	Make inferences and draw conclusions based on explicit and implied information from texts.

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All lessons	I.C.8	Create outlines, logical notes, and summaries of text in various content areas.
All lessons	I.C.12	Follow written directions in technical reading.
All lessons	II.A.1	Write frequently in a variety of forms, including but not limited to the following: poetry, stories, essays, editorials, letters, directions and research reports. <i>By the end of grade 8, student will have written in all forms listed.</i>
All lessons	II.B.1	Create multiple paragraph compositions that state, maintain and use details in a logical order to support a main idea.
All lessons	II.B.3	Create informative reports, including gathering material, formulating ideas based on gathered material, organizing information and editing for logical progression.
All lessons	II.B.7	Consider the intended audience when composing text.
All lessons	II.C.1	Compose complete sentences when writing.
All lessons	II.C.3	Apply grammar conventions correctly in writing.
All lessons	II.C.4	Apply punctuation conventions correctly in writing.
All lessons	II.D.1	Formulate questions, collect, organize and synthesize relevant information from a variety of sources, including print and electronic media.
All lessons	III.A.1	Participate in and follow agreed-upon rules for conversation and formal discussions in large and small groups.
All lessons	III.A.2	Actively listen and comprehend messages.
All lessons	III.A.4	Distinguish between speaker's opinion and verifiable facts and analyze the credibility of the presentation.
All lessons	III.A.6	Orally communicate information, opinions and ideas effectively to different audiences, adjusting delivery and language for intended audience and purpose.
All lessons	III.A.7	Participate effectively in group meetings.
3	III.C.1	Evaluate the accuracy and credibility of information found on Internet sites.
3	III.C.3	Critically analyze the messages and points of view employed in different media, including advertising, news programs, web sites and documentaries.

**National Health Education Standards – Grades 6 – 8: cited from pre-publication document of National Health Education Standards, Pre K-12, American Cancer Society, December 2005 – August 2006**

Lesson	Standard	Performance Indicator
3, 4	1.8.1	Analyze the relationship between healthy behaviors and personal health.
3	1.8.3	Analyze how the environment impacts personal health.
4	1.8.5	Describe ways to reduce or prevent injuries and other adolescent health problems.
3, 4	1.8.7	Describe the benefits and barriers to practicing healthy behaviors.
3, 4	1.8.8	Examine the likelihood of injury or illness if engaging in unhealthy behaviors.
3, 4	1.8.9	Examine the potential seriousness of injury or illness if engaging in unhealthy behaviors.

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<b>3</b>	<b>2.8.3</b>	Describe how peers influence healthy and unhealthy behaviors.
<b>3</b>	<b>2.8.8</b>	Explain the influence of personal values and beliefs on individual health practices and behaviors.
<b>3, 4</b>	<b>2.8.9</b>	Describe how some health risk behaviors can influence the likelihood of engaging in unhealthy behaviors.
<b>3, 4</b>	<b>2.8.10</b>	Explain how school and public health policies can influence health promotion and disease prevention.
<b>3, 4</b>	<b>3.8.1</b>	Analyze the validity of health information, products, and services.
<b>3, 4</b>	<b>3.8.4</b>	Describe situations that may require professional health services.
<b>3, 4</b>	<b>4.8.1</b>	Apply effective verbal and nonverbal communication skills to enhance health.
<b>3</b>	<b>5.8.1</b>	Identify circumstances that can help or hinder healthy decision-making.
<b>3, 4</b>	<b>5.8.2</b>	Determine when health-related situations require the application of a thoughtful decision-making process.
<b>3, 4</b>	<b>5.8.3</b>	Distinguish when individual or collaborative decision-making is appropriate.
<b>3, 4</b>	<b>5.8.5</b>	Predict the potential short and long-term impact of each alternative on self and others.
<b>4</b>	<b>5.8.6</b>	Choose healthy alternatives over unhealthy alternatives when making a decision.
<b>3, 4</b>	<b>5.8.7</b>	Analyze the outcomes of a health-related decision.
<b>3, 4</b>	<b>7.8.3</b>	Demonstrate behaviors to avoid or reduce health risks to self and others.
<b>3, 4</b>	<b>8.8.1</b>	State a health enhancing position on a topic and support it with accurate information.
<b>4</b>	<b>8.8.2</b>	Demonstrate how to influence and support others to make positive health choices.
<b>4</b>	<b>8.8.4</b>	Identify ways that health messages and communication techniques can be altered for different audiences.